NASA ARSET Extended Session on Water Quality Monitoring Using Remote Sensing Observations
May 5, 2016

Demonstration: Short guide to processing Landsat-8 imagery for water quality monitoring

This step-by-step guide accompanies the short demo on how to acquire, process and visualize imagery acquired by the Landsat-8 Operational Land Imager (OLI) for the purpose of producing high spatial resolution water quality maps (turbidity, chlorophyll-a).

There are three steps in this process:
Step 1: Find and download your data of interest using *GloVis*
Step 2: Process the Landsat-8 using *ACOLITE*
Step 3: Visualize the products using *SeaDAS*

The scenes from the Landsat-8 Operational Land Imager have a spatial resolution of 30 m, and collected every 16 days.

The procedures presented in this document are applicable on both Mac and PC, and Linux.

Software needed:
1. *ACOLITE* freely available at:
   http://odnature.naturalsciences.be/remsem/software-and-data/acolite/

2. *SeaDAS*, freely available at:
   http://seadas.gsfc.nasa.gov

Additional resources:

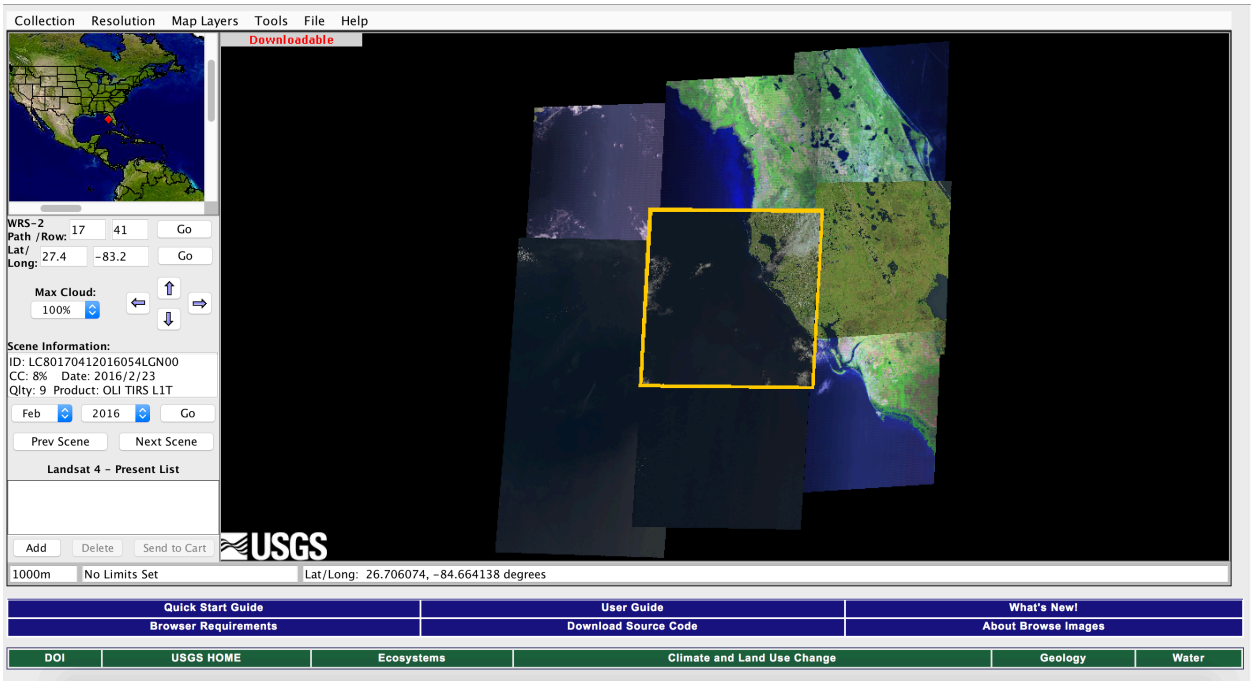
Manual for ACOLITE:
http://odnature.naturalsciences.be/downloads/remsem/acolite/ACOLITE_processing_options_20160120.0.pdf

Video tutorial for SeaDAS on Youtube:
https://www.youtube.com/watch?v=rSTM1e7tfsg

Step 1: Acquiring landsat-8 imagery using the USGS Global Visualization Viewer (GloVis)

1) Go to http://glovis.usgs.gov

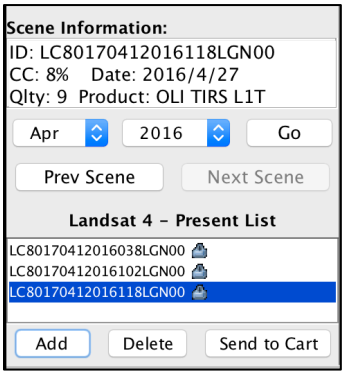
   Note The USGS Global Visualization Viewer (GloVis) requires a web browser with Java and JavaScript enabled.



2) Find the scenes corresponding to your area of interest using either approach:
   - Using the map applet (top left-hand corner)
   - By entering the WRS-2 Path and Row information, if you know it
   - By using the latitude and longitude of the point of interest.

3) If needed, adjust "Max Cloud", the maximum cloud cover criteria

4) Use the "Scene Information", the month and year buttons, and the "Prev Scene" and "Next Scene" buttons to navigate to the scenes of interest.
   Note that under "Scene Information", you want to only select Landsat-8 scenes which are shown as "Product: OLI TIRS L1T".



5) Use the "Add" button to add all the scenes to be downloaded.

6) Then use the "Send to Cart" to proceed with downloading the selected scenes. This will take your order to the usgs earthexplorer website: https://earthexplorer.usgs.gov/order/

   If you haven't one already, you will need to create a USGS user account with the EROS Registration System (ERS) before you can download

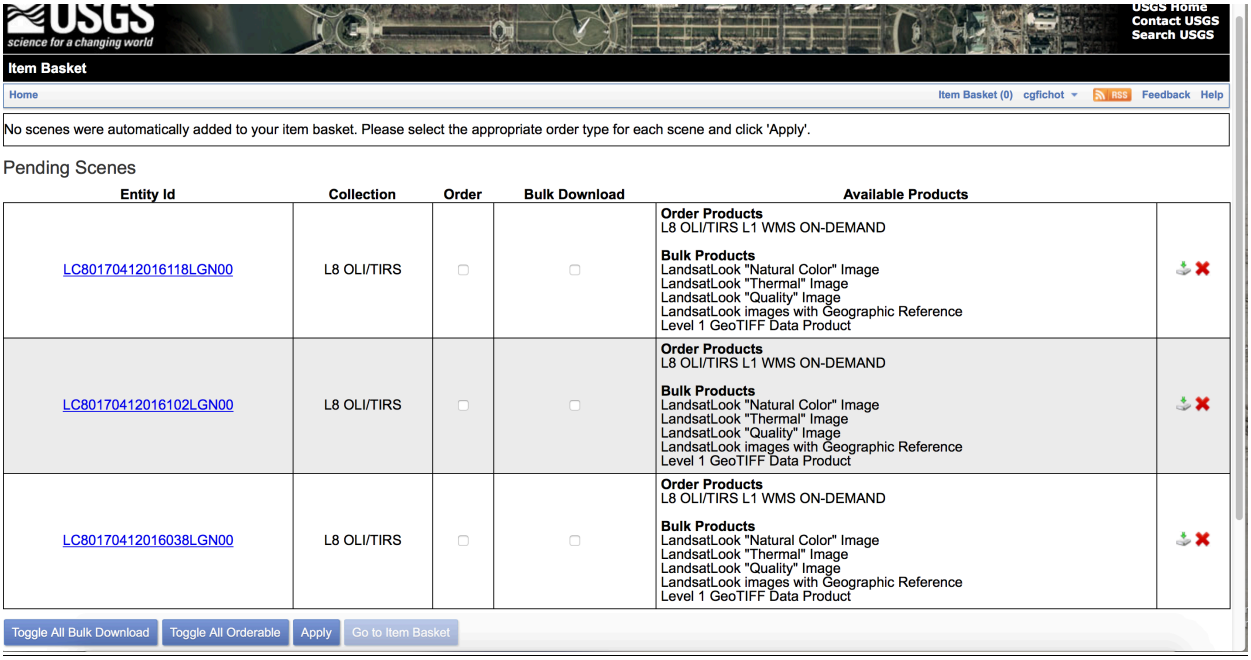
7) Finally, you can download each scene individually, or do a bulk download.

You can different products:

LandsatLook "Natural Color" Image
LandsatLook "Thermal" Image

LandsatLook "Quality" Image
LandsatLook images with Geographic Reference
Level 1 GeoTIFF Data Product

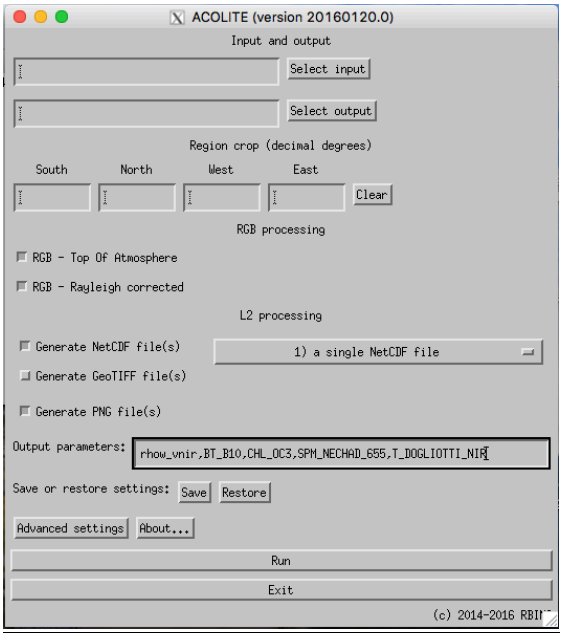
For further processing with ACOLITE, you will need to download the Level1 GeoTIFF Data Product. Note that each file is large, about 1Gb.



Step 2: Processing using ACOLITE

1) Download and install ACOLITE, which is freely available at
   http://odnature.naturalsciences.be/remsem/software-and-data/acolite/

2) Once installed, start ACOLITE, which will take you to the interface shown below



2) You will need to select:
   - Path to the input file folder (the GeoTIFF file acquired using GLOVIS)
   - Path to the output products from processing the input file (note the path for the outputs must be different from that of the input file folder). I suggest creating a folder names "Processed" within the input folder and select it as the outputs folder.
   - If needed, add the latitude (South/North) and longitude (West/East) of a sub-region of interest. This will speed up processing time and output file size if only a sub-region of the scene is of interest.
   - Select the products of interests, choose the advanced settings and "Run" the processing. Note the water quality outputs of interest are to be listed in the "Output parameters"

Explanations and details about the products of interests and advanced settings of the processing are provided in the ACOLITE manual available here:

http://odnature.naturalsciences.be/downloads/remsem/acolite/ACOLITE_processing_options_20160120.0.pdf

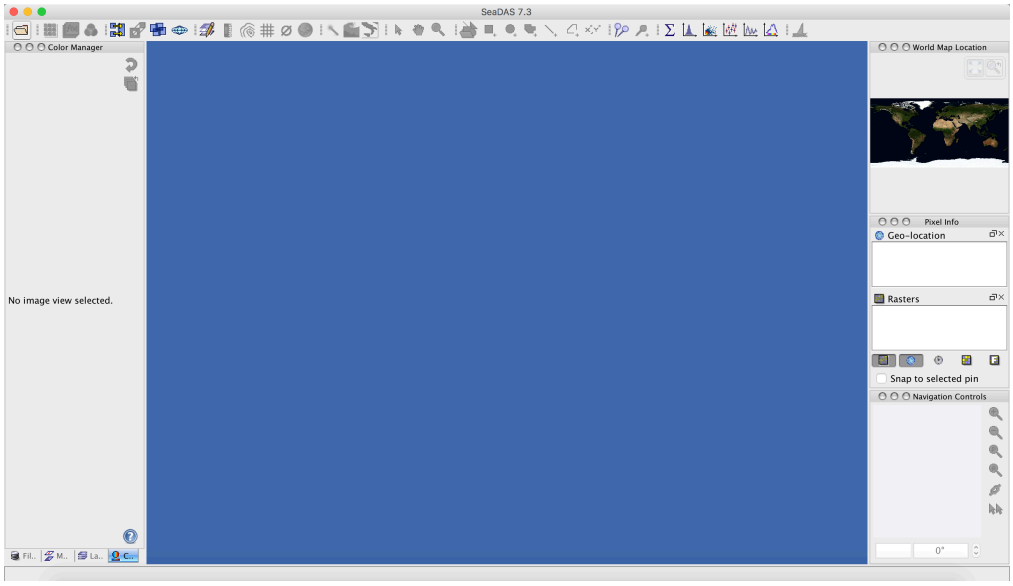
3) After the processing is done (generally a few minutes), the output files can be found in the output folder (the folder named "Processed"). The folder will contain the main

netCDF file (LC8*.nc) containing the different products generating from the processing. The data within the netCDF file can be visualized in SeaDAS.

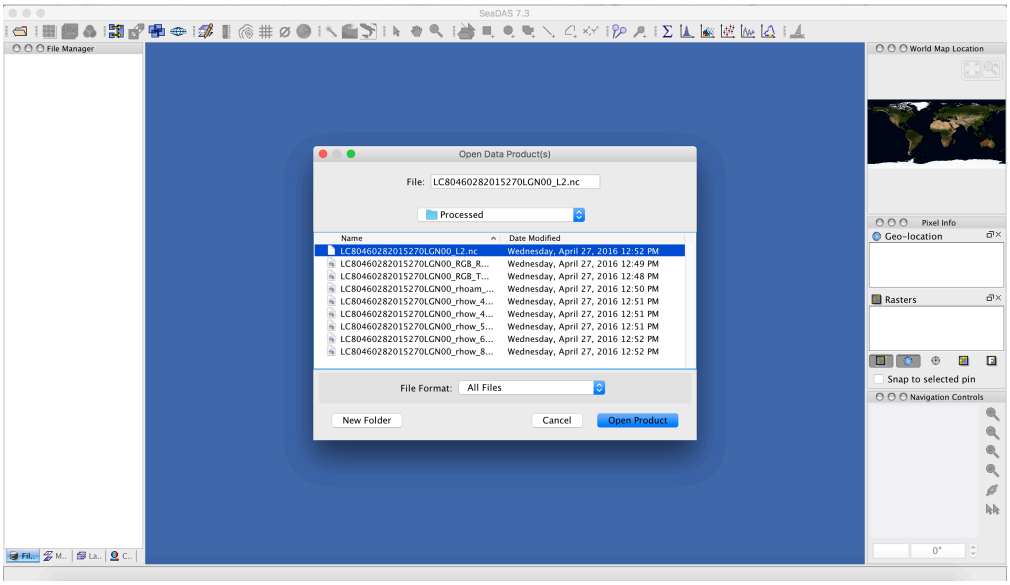
Step 3: Visualize the data using SeaDAS

1) Download and install SeaDAS, which is freely available at http://oceancolor.gsfc.nasa.gov/seadas/

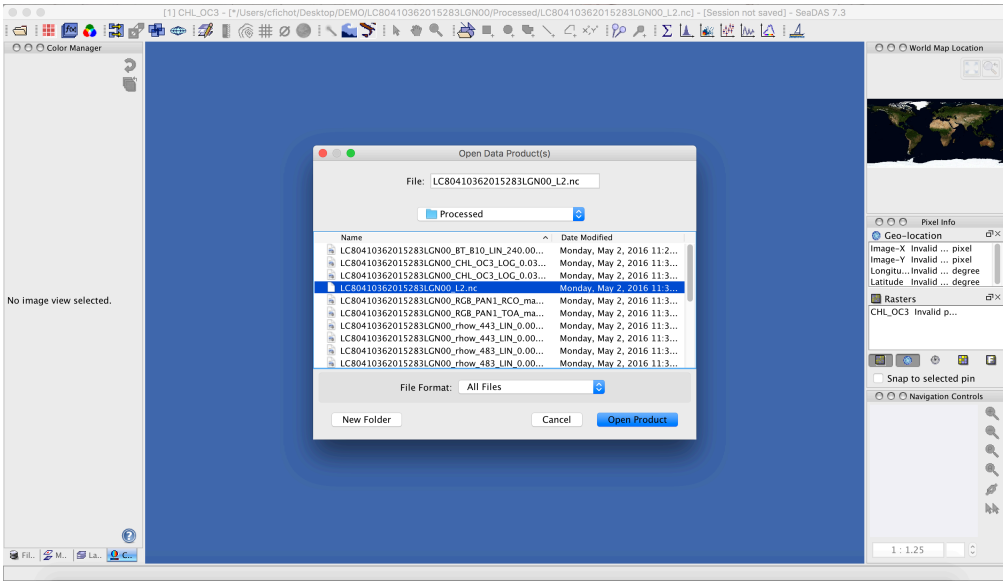
2) Once installed, start SeaDAS, which will take you to the interface shown below



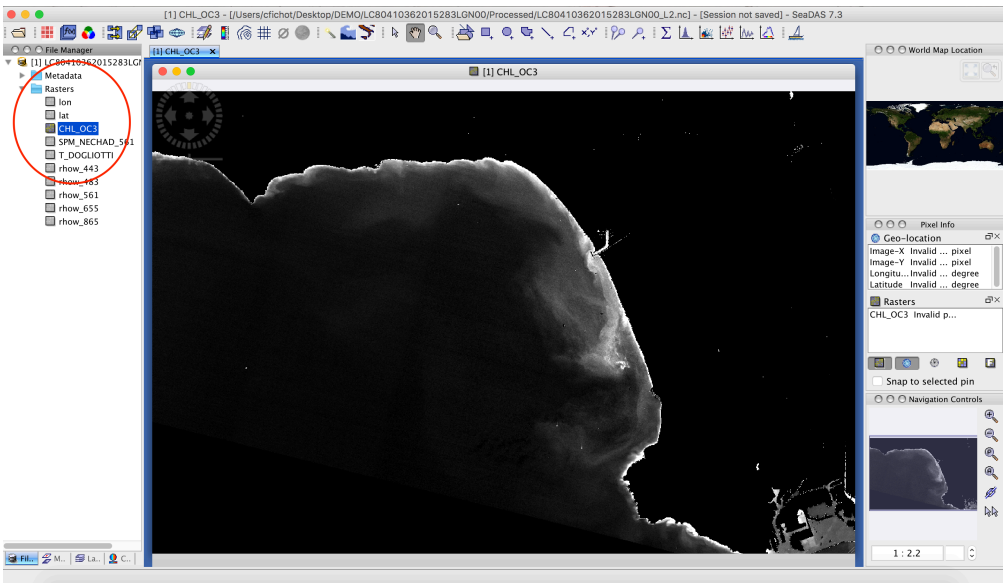
3) Go to File > Open, and select the LC8*nc file in the "Processed" folder containing the output files



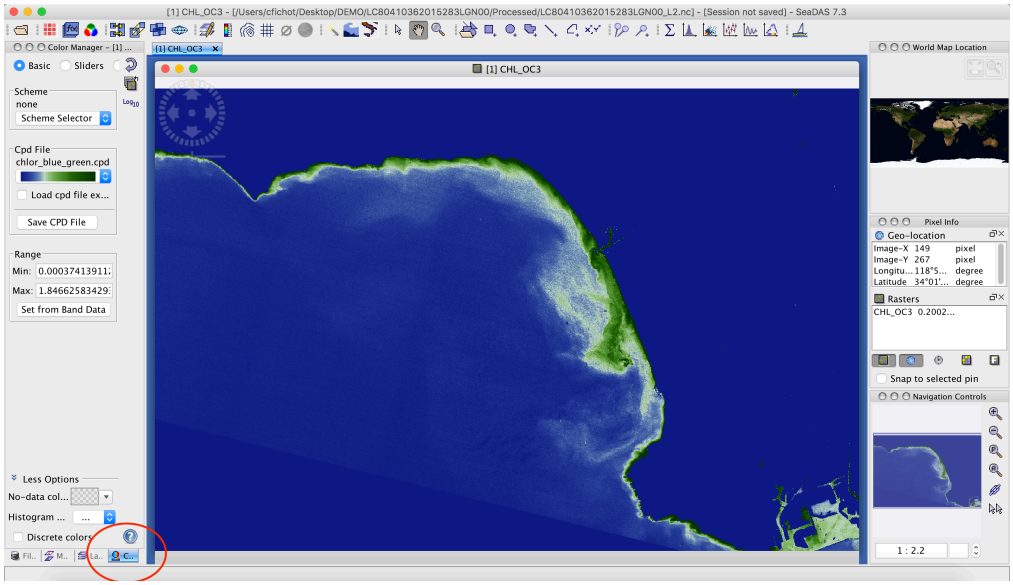
4) Go to File > Open, and select the LC8*nc file in the “Processed” folder containing the output files



5) Go to File > Open, and select the LC8*nc file in the “Processed” folder containing the output files. This will add the file to the “File Manager” (to the left). Then you can select the product to be visualized under the “Rasters” of the corresponding LC8*nc file.



6) You can adjust color bars, range by switching to the Color Manager (bottom left).



7) SeaDAS contains many additional tools for exploring the processed data:
For more details on how to use SeaDAS, go to the SeaDAS website for demos and tutorials:
http://seadas.gsfc.nasa.gov

Video tutorial for SeaDAS on Youtube:
https://www.youtube.com/watch?v=rSTM1e7tfsg